upper third of the femur, will doubtless, in many difficult cases, prevent the return of the head to the pelvic cavity. On the other hand, cases may be met with in which only a slight degree of extension may be called for.

In cases of failure to replace the head of the femur within the acetabulum, operative interference may offer the only hope of satisfactorily dealing with such a condition; but the particular type of operation, and the advantages to be gained by it, will depend much upon features opposing the reduction.

Measures of a radical nature must of necessity be viewed with much skepticism, as the indications calling for this kind of interference are difficult, if not impossible, to understand. Efficient operative measures in actabular fractures, except for the repair of injuries to the pelvic viscera, have yet to be described, and must, therefore, if indicated at all, depend entirely upon a clear understanding of the true nature of the injury, and knowledge of such measures as will overcome any and all obstacles to its correction.

CONGENITAL SYPHILIS OF THE HEART.

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The purpose of this paper is to show that there exists an especial form of interstitial myocarditis, localized or diffuse, due to the presence of the Spirochæte pallida, and resulting from congenital infection. This form of myocarditis may exist independently of any other signs or symptoms of congenital syphilis—in fact, it may be the only pathological condition attributable to syphilis that can be demonstrated at autopsy in the body of the patient; or other lesions of congenital syphilis may be associated with it. Secondly, this form of syphilitic disease of the heart is an important cause of asphyxia neonatorum and unexplained sudden death in early life; and some of the cases prove that it may cause cardiac weakness in childhood and youth, forming an anlage upon which subsequent infections (streptococcic particularly) produce valvular lesions. Further, the condition may be associated with infantilism, hypoplastic constitution or less severe grades of underdevelopment. Finally, it may lead also to the production later in life of fibroid heart and coronary sclerosis, with the complications and sequelæ incident to these conditions.

The material upon which these conclusions are based consisted of autopsy material of 12 cases furnished in part by the clinics of the

University Hospitals, and in part from the private practice of Ann Arbor and Detroit colleagues. Without giving a detailed description of each of these cases, they may be divided into three groups according to the age of the patient: (1) Cases occurring in infancy; (2) in childhood, and (3) after the age of puberty. Three-fourths of the cases fall into the first two classes—infancy and early childhood. Of these 9 cases only 1 had been diagnosticated as congenital syphilis before death. The others all came to autopsy that the problem of an undiagnosticated condition and unexplained death might be solved. Of the 3 cases occurring after the age of puberty (ages fifteen, eighteen, and twenty-two years), all had an old history of cardiac disease, and all showed decided underdevelopment, one a girl, aged eighteen years, presenting a marked condition of infantilism. The oldest case was a young woman student giving a history of having been a "blue baby," and having from birth suffered from cardiac disturbance. Death took place from a streptococcus—endocarditis and septicemia engrafted upon an older interstitial myocarditis. Her father was in the late stages of locomotor ataxia. A clinical history of congenital syphilis was obtained in the other 2 cases after the diagnosis had been made pathologically.

My share in these cases having been wholly from the pathological side, it is not necessary to go further into the clinical history than the main points given above, which may be briefly stated as follows: Only in the older cases was there a definite history of cardiac affection, and in none of the cases was syphilis considered by the clinician as having anything to do with the clinical symptoms and termination of the case. Only in 1 case was congenital syphilis positively diagnosticated clinically, and in this case no affection of the heart was suspected, although at autopsy this organ showed the most severe interstitial myocarditis, with the greatest number of spirochetes present, of all the cases. For the sake of brevity, the pathological conditions may be summed up as follows:

1. *Gross Appearances.* In the majority of the early cases the heart was large and dilated; in the others, normal in size or even undersized. The heart muscle was usually pale or contained lighter areas. The walls were usually thicker than normal, the right ventricular wall in some cases being as thick as the left, justifying a diagnosis of hypertrophy from the gross appearances. The muscle seemed moister, softer, and more translucent than normal. In other hearts, aside from a dilatation of the cavities, nothing pathological was noted in the gross examination, and the condition was not discovered until microscopic examination was made. Localized patches of interstitial myocarditis can exist without causing notable changes in the gross appearances. In the older cases there was in all the gross picture of a mitral endocarditis, with insufficiency, compensatory hypertrophy, and dilatation. Nothing in the gross appearance indicated the existence of a syph-

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ilitic myocarditis, and this condition was not discovered until the microscopic examination.

2. *Microscopic Appearances.* The common feature of all of these cases is the occurrence throughout the myocardium of numerous or few light-staining patches (hematoxylin and eosin or Van Gieson's), separating or replacing the muscle fibers, and made up of a fibroblastic or myxomatous tissue, having a delicate granular or fibrillar reticulum in which lie numerous cells of lymphocyte or plasma-cell type, as well as numerous large epitheloid cells with abundant pink-staining granular protoplasm and pale nuclei. The latter type of cells presents the greatest variety of size and form, round, oval, spindle, branched, etc. Many of these cells are vacuolated (Fig. 3); and fragmentation, with loss of nucleus, is a common feature of the larger patches. The infiltration of plasma cells and cells of the large lymphocyte type is often so marked as to catch the eye at once as a focus of small-cell infiltration. The most characteristic feature of all of these cases, however, is the light-staining, fibroblastic tissue containing peculiar degenerating cells of fibroblastic or epithelioid type (Fig. 5). The characteristics of this interstitial process are so marked and differ so much from ordinary interstitial processes that when its peculiarities are once recognized it is identified with ease.

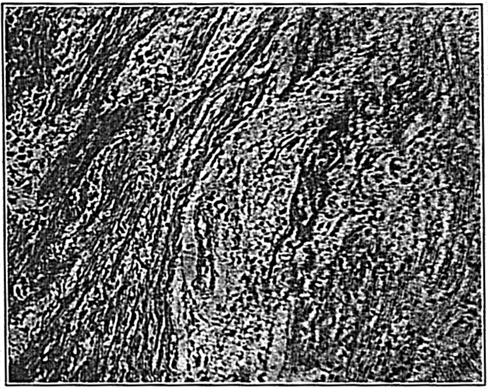

FIG. 1.—Congenital syphilis of the heart. Sudden death second week after birth. Areas of interstitial myocarditis. (Low power.)

The process does not seem to be confined to any one part of the heart wall. It may be diffuse (Fig. 2), occurring in nearly every section taken; in other cases, many blocks may be cut before a patch is found. In some cases, the left ventricular wall, or the septum, may show the most numerous patches, but in the newborn the wall of the right ventricle usually showed the most marked changes. Some blocks show the process to be most marked beneath the epicardium (Fig. 6), others show it localized beneath the endocardium. On the whole, the process seems to be more frequently localized near the epicardial surface. A striking feature of the patches is their tendency to run in narrow or broader bands between the muscle fibers.

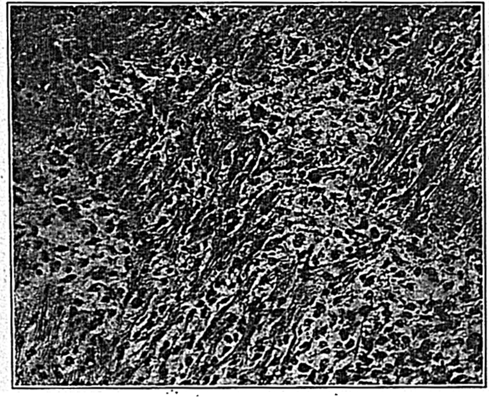

Fig. 2.—Diffuse interstitial fibroblastic proliferation. Congenital cardiac syphilis. (Higher power view.)

These bands may be of the width of 5 to 20 muscle fibers. Rarely are they large enough to be seen with the naked eye. From the larger bands smaller strands invade the neighboring muscle separating the fibrils. In sections of muscle cut transversely occasional broad bandsof the light interstitial tissue cross the field (Fig. 5). Occasionally, large arreas of a more diffuse process are found, the muscle fibrils appearing smaller than normal and separated by narrow strands of fine reticulum containing the large epithelioid cells, so different in size and staining and amount of cell body from the normal stroma of the heart wall.

The interstitial process seems to follow the smaller arterioles and capillaries. It is abundant also about the medium-sized vessels (Fig. 3), less so about the larger ones, although perivascular collections of lymphocytes and plasma cells are numerous about these. The smaller vessels show an epithelioid proliferation of their walls, and the lumina are often wholly filled with cells of the same type as those of the stroma. The larger vessels, both arteries and veins, show varying degrees of thickening, the intima and the adventitia showing most prominently the result of cellular proliferation. Even in some of the newborn cases the adventitia of some of the larger vessels was markedly increased and distinctly fibroid in character (Fig. 4). Obliterating endarteritis, however, was not the common or most characteristic feature of these congenital cases, and in that respect the condition differs also from the common variety of acquired syphilis of the heart seen in adults. The most prominent feature of all of these cases is the *fibroblastic or epithelioid proliferations of the stroma along the course of the smallest vessels and apparently arising from their walls or from the perivascular tissue.*

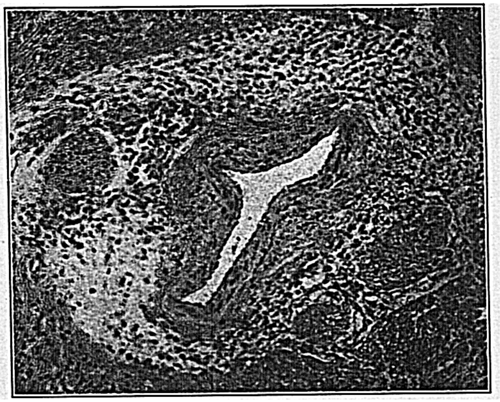

FIG. 3.—Congenital cardiac syphilis. Perivascular fibroblastic proliferation. Neighboring heart muscle (upper left) shows marked fatty degeneration (vacuolation).

Another striking feature of the process, as shown in all cases, is the condition of the heart muscle fibrils. Those show in the immediate neighborhood of the fibroblastic proliferations a peculiar pale coagulation-degeneration or necrosis, the protoplasm losing its striations and its ability to take the eosin stain, while the nuclei are larger, swollen, and stain but lightly with hematoxylin. In the areas where the intermuscular proliferation is most marked and the fibrils most widely separated, bundles of pale atrophic fibrils are occasionally seen, the protoplasm of which will no longer take the eosin; and it is almost impossible to distinguish the fibrils from the surrounding epithelioid tissue except by their form and branching. Such fibrils appear to be gelatinous or partially liquefied. They still contain large, pale-staining nuclei, and there is an apparent increase of the latter. This point could not be definitely determined, as in thin sections it was practically impossible to tell whether the nuclei belonged to the fibrils or to the epithelioid tissue, and in thicker sections the difficulty of judgment was even greater Fat vacuoles were common throughout the degenerated fibrils.

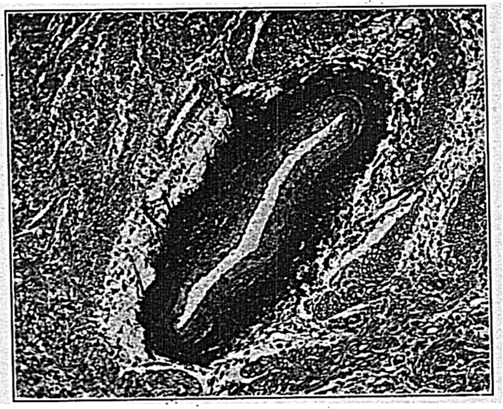

FIG. 4.—Perivascular fibroid thickening and proliferation. Marked fatty degeneration of muscle. Congenital syphilis. (Low power.)

It must not be forgotten that in some hearts the intermuscular proliferations of the stroma are not so striking on first sight, but that to the casual observer they might be interpreted simply as an "increase of stroma," "œdema," etc., without any suspicion of their syphilitic nature being aroused. Indeed, it was only the discovery that such soft, cellular semifluid portions of the cardiac stroma contained spirochetes in great numbers that first led to their recognition as syphilitic, and furnished me, at least, with a criterion, on the basis of which I now unhesitatingly class such charges in the heart as syphilitic beyond any question.

In all of my cases the interstitial changes outweighed in prominence the vascular ones; indeed, in some of the early cases evidences of endarteritis could be found only after some search. The older the case, the greater the involvement of the large and medium-sized bloodvessels, and the greater the frequency of occurrence of fibroid patches about the vessels or in the heart muscle. In the oldest case the soft, fibroblastic areas were found, just like those in the younger hearts, and it was from such interstitial formations that the suspicion of congenital syphilis was first entertained. The occurrence of fibroid patches in the older cases in association with the fibroblastic areas and more marked vascular areas points to an age-relationship between the two conditions, although the fibroid areas may have been the result of an anemic infarction due to the obliteration of the arteries, rather than as the result of a fibroid transformation of the fibroblastic tissues. *No gumma-formation* was found in any of these cases, and the process is not identical with the gummatous myocarditis seen in late acquired syphilis. It is characterized by a much less lymphocyte and plasma-cell infiltration, and is irregularly diffuse rather than circumscribed, and there is no central caseation. Giant cells were never found. There is also no new formation of bloodvessels containing blood, although

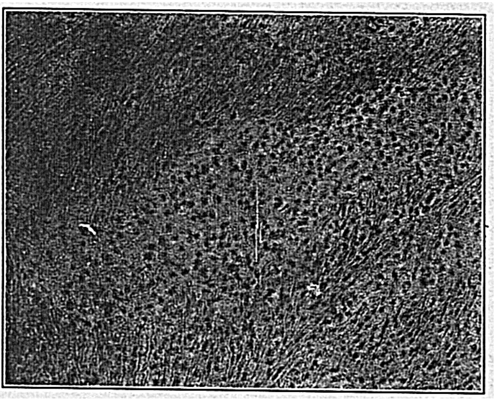

FIG. 5.—Pale, epithelioid area in heart of newborn; congenital syphilis.

it is possible that the fibroblastic areas may be largely made up of cells derived from the proliferating vessel walls.

Besides the peculiar pale degeneration of the muscle fibrils described above, larger areas of vacuolated muscle fibers occur in the neighborhood of the larger bloodvessels (Fig. 6). These vacuoles give the fat reaction with Sudan III and Scharlach R. In some of the newborn hearts this fatty degeneration of the heart muscle was so extensive as to account in part for the pale color and greater translucency of the heart wall. Cellular infiltration and fibroblastic proliferation were, as a rule, absent from these areas of fatty muscle. As described above, the muscle fibrils of the areas of interstitial change showed the pale degeneration with loss of staining power and striation rather than this more marked fatty change, although often containing numerous small vacuoles.

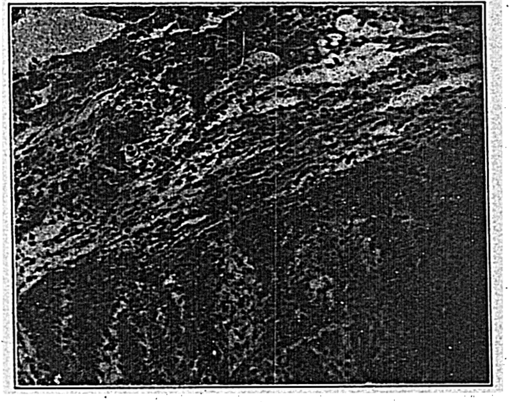

FIG. 6.—Area of lymphocyte-infiltration in epicardium of heart of newborn; congenital syphilis.

Localized fibroblastic proliferations of the endocardium were occasionally found, the new tissue showing the same characteristics as that of the intermuscular areas. Beneath the epicardium small areas of lymphocyte and plasma-cell infiltration were common in the more severe cases (Fig. 6), and in such areas the epithelioid proliferation was not as marked as between the muscle fibrils. Fibroid thickenings (sclerotic patches) were found on both epicardium and endocardium of the older cases. Here again an age relationship is possible, but cannot be determined positively.

Of the other organs of these cases, the liver and spleen most frequently showed evidences of congenital syphilis in the form of the characteristic intralobular increase of the reticulum in the liver, and the diffuse reticular hyperplasia of the spleen. One very important point established was the occurrence of the syphilitic changes in the heart, as described above, in the absence of lesions of congenital syphilis elsewhere. Another feature of some importance is the occurrence of numerous hyaline glomerular scars in the kidneys of these cases. I have long looked upon the occurrence of hyaline glomeruli in the kidneys of the newborn as an important sign of congenital infection or intoxication—usually syphilitic. It has been a common finding in all cases of congenital syphilis the kidneys of which I have examined. Syphilitic changes in the wall of the aorta and larger arteries were also found and will be reported in another article.

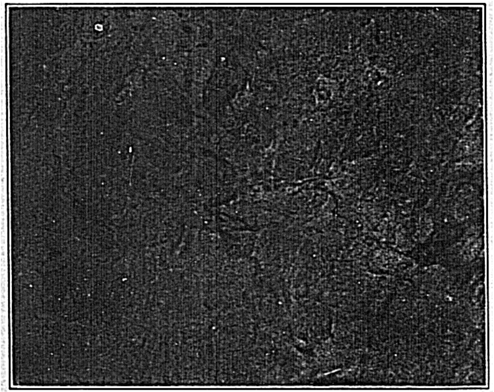

FIG. 7.—Spirochetes in area of fibroblastic proliferation. Congenital cardiac syphilis. The numerous black dots and lines represent portions of spirochetes. (About 1000+)

The proof of the syphilitic character of this form of interstitial myocarditis rested upon two points—the co-existence of typical syphilitic liver, or upon the demonstration of the presence of spirochetes. Levaditi's method was employed for this purpose. In sections so treated the fibroblastic epithelioid areas of the heart wall were found to be crowded with spirochetes (Figs. 7 and 8). They lay at every possible angle and in every direction in the soft semifluid intercellular substance, and between and upon the muscle fibrils, and in the case of the very pale degenerated fibers apparently within the substance of the fibril (Fig. 9). In the young hearts the parasites stood out sharply and clearly revealed their distinguishing characteristics. Their number was often surprising. Every section would show great numbers cut at all planes and angles (Fig 7). Wherever the fibroblastic areas were present spirochetes were always present, usually in very large numbers. They were always more easily demonstrable in heart muscle than in liver or spleen, the coarser reticulum in the latter organs obscuring the picture more or less. For the demonstration of spirochetes within tissue I know of no material so valuable for class work as congenital syphilis of the heart.

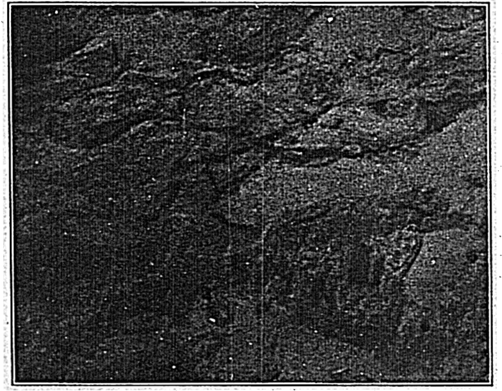

FIG. 8.—Congenital cardiac syphilis. Spirochetes in area of intermuscular fibroblastic proliferation. (About 1500+)

In the portions of the heart wall away from the areas of proliferation and pale degeneration of the muscle occasional spirochetes are found in the tissue spaces, but never so abundantly as in the pathological areas. Within the bloodvessels they are frequent. Their infrequency in the areas of marked fatty degeneration around the larger vessels makes it the more probable that this change is due to localized circulatory disturbances rather than to the localization of the spirochetes. One very important finding was the localization of spirochetes in the heart when they could not be found elsewhere.

Summing up the findings in these cases we must conclude that there exists not infrequently a characteristic form of interstitial myocarditis due to the localization of colonies of the spirochete pallida, the infection being congenital in its origin. Turning to the literature on syphilis we find everywhere the statement that congenital syphilis of the heart is rare. It is only recently that the important role played by acquired syphilis in the production of cardiac disease in the adult is becoming recognized. The writers of the generation just passing away, with but few exceptions (Semola, Sachajin, etc.), considered syphilis of the heart as rare. Within recent years this view has changed so rapidly that the statement is now made that at least one-tenth up to one-third or more of all cases of heart disease are due to syphilis. In this change of view, congenital syphilis has not been included, and the most recent chapters upon the subject still insist upon the rarity of congenital syphilis. These conclusions are based largely upon the study of heart syphilis made by Mracek[1] in 1893.

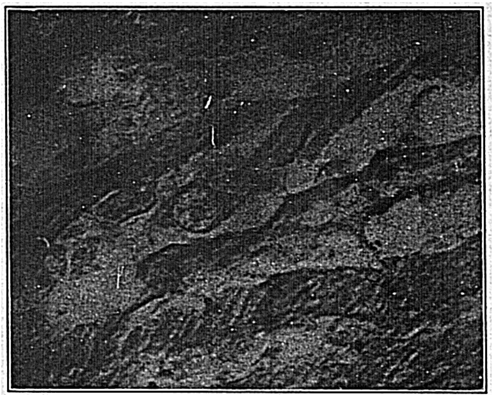

FIG. 9.—Congenital cardiac syphilis. Spirochete in or upon muscle fibril showing pale degeneration. (About 1500+)

Of the 112 cases of heart syphilis collected by Mracek, only 9 were regarded as congenital; and as Hektoen has already pointed out, the syphilitic nature of some of these is doubtful. In 1 case, however, that of Coupland,[2] the condition was evidently that of a diffuse interstitial myocarditis. In 150 autopsy examinations of congenital syphilis studied by Mracek, only 4 cases of cardiac syphilitic affections were found, 2 representing a nodular or gummatous form, the other 2 a most acute, diffuse, interstitial type of myocarditis. Since Mracek's study the number of reported cases of congenital cardiac syphilis has not been greatly increased. Hektoen,[3] in 1896, reported a case of focal interstitial myocarditis in an infant aged six weeks. The description of intermuscular infiltration suggests strongly the same type of myocarditis as described above, but the nodular or gummatous character was marked enough to justify him in regarding it as a gummatous myocarditis due to congenital lues. Hektoen takes occasion to point out the dangerous nature of congenital syphilitic myocarditis as a possible cause of sudden death in apparently healthy children and concludes that the lesion has a clinical and practical interest of much greater weight than the interest previously accorded it as a pathological curiosity. In 1897, Guggenheimer[4] described a rare case of fatty degeneration of the heart in a syphilitic newborn. He regarded it as a rare form of syphilitic myocarditis, differnt in type from the gummatous or fibroid forms. In 1898 Le Count[5] reported a case of "gumma" of the heart in the newborn. His description of the microscopic findings agrees with that of my cases, and the condition is apparently the same, the white area seen being a large patch of diffuse interstitial myocarditis without true gumma formation.

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[1] Arch. f. Derm. u. Syph., Ergänzungsheft, 1893, ii.

[2] Trans. Path. Soc., London, xxvii, 303.

In 1898 Adler[6] made the most important contribution to the knowledge of congenital syphilis that has yet been given. Adler examined the hearts of four syphilitic infants, without any symptoms of cardiac disease, and dying of acute enteritis. To the naked eye the hearts appeared perfectly normal. In 2 of the cases he was unable to discover any changes that could be attributed to syphilis. In the other two hearts he found lesions regarded by him as undoubtedly syphilitic. One of these hearts showed only a localized patch of proliferating endarteritis in a small branch of the left coronary artery, at the point of greatest development almost occluding the vessel, and in the immediate neighborhood of the vessel a minute area in which the muscle fibrils were more widely separated than normal and the intermuscular spaces infiltrated with cells. The other heart showed a condition that, from the description given and from his Figs. 2, 3, and 4, is surely identical with the form of interstitial myocarditis seen in my cases. This heart was from a male child, aged three and one-half months, dying from intestinal catarrh and bronchopneumonia. The intermuscular proliferation described by Adler as occurring in this case are of the same type as in my cases; he noted the same degenerative changes in the muscles, and the fact that the lesions were most abundant near the epicardium. In both of these cases Adler's criterion for the diagnosis of syphilis was based upon the vascular changes, particularly the endarteritis. He regarded the intermuscular condition, however, as representing a very early state of interstitial myocarditis. Adler concludes his article by emphasizing the necessity of methodically considering syphilis as an etiological factor in heart disease.

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[3] Jour. Path. and Bact., 1896, p. 472.

[4] Inaug. Diss., Würzburg, 1897.

[5] Jour. Amer. Med. Assoc., 1898, p. 180.

[6] New York Med. Jour., 1898, p. 577; Trans. Assoc. Amer. Phys., 1898, vol. xiii.

From these few observations of congenital syphilis of the heart found in the literature, it is easily understood why all the textbooks consider it to be rare. It must be borne in mind, however, that the old criterion of diagnosis of heart syphilis, depended upon the finding of a gumma in the heart. What is really the case is the fact that *gumma of the heart is rare in congenital syphilis, but that congenital syphilis of the heart in the form of a localized or diffuse interstitial myocarditis is most probably not rare. The new criterion is the demonstration of the Spirochæte pallida* in the proliferating interstitial tissues of the heart wall. Adler could base his diagnosis of syphilis only upon the endarteritis. I have shown that the same type of interstitial myocarditis in the absence of coronary endarteritis is syphilitic, by demonstrating that these light-staining patches of proliferating stroma represent localized colonies of the spirochete and that the organism occurs in such patches in extraordinary numbers. The myocarditis described by Coupland, Hektoen, and Le Count, I believe, to be of the same type, sufficiently localized in the cases reported by the last two writers to be visible to the naked eye and to be interpreted as gummata. It is very probable that this form of congenital cardiac syphilis is not uncommon. As the cases of Adler and mine show, it may exist to a marked degree without causing any macroscopic changes in the heart hitherto regarded as syphilitic. Therefore, in all cases of cardiac disturbance in children, congenital syphilis should be carefully considered as a possible factor.

My series of cases also show that it can be a cause of asphyxia neonatorum and unexplained sudden death in infancy. Under such circumstances the possibility of congenital cardiac syphilis must be borne in mind and a thorough microscopic study of the heart carried out. The same thing is true of cases of non-development, infantilism, chronic valvular lesions in children, and young adults, etc. For all of these conditions an etiology of congenital syphilis of the heart is possible, and the diagnostic criterion is the demonstration of fibroblastic areas in the heart wall containing colonies of spirochetes.

The fatty degeneration of the myocardium described by Guggenheimer and believed by him to be due to syphilis, deserves mention here, since all of my cases showed patches of marked fatty change. As suggested by Guggenheimer, it may be the result primarily of the syphilitic infection, or it may be caused by it secondarily as a result of a lack of oxygen.

In conclusion, congenital syphilis of the heart occurs most frequently in the form of a diffuse interstitial myocarditis due to the presence of the Spirochæte pallida in large numbers, without ordinarily producing characteristic macroscopic changes so that the absence or presence of congenital cardiac syphilis can be told only by a thorough microscopic examination of the heart wall.

PERSONAL EXPERIENCES WITH THE USE OF SALVARSAN (DIOXYDIAMIDOARSENOBENZOL, OR "606") IN THE TREATMENT OF SYPHILIS.

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The announcement less than a year ago of a discovery by Ehrlich of a new cure for syphilis created much excitement in medical as well as lay circles. The reports in the literature following the early trials of the new remedy led many to believe that the millenium had been reached so far as the treatment, and thus the cure, prevention, and eradication of that protean disease, syphilis, was concerned. By many the antispecific, mercury, was already relegated to the rank of second choices in the selection of a drug to combat the disease. Recently the pendulum has swung the other way; a sound reaction has taken place, and the new remedy, salvarsan, now bids fair to take its proper place in the list as a result of scientific study of many thousand cases of lues in all its phases. But the complex and manifold nature of the matter under investigation will necessitate the gathering and correlation of a mountain of data before a just and accurate verdict can be reached.

Through the generosity of Professor Ehrlich, salvarsan has been tried in more than 30,000 cases of syphilis in an effort to establish its real value and to determine what dangers, if any, attend its application in man. The trend of opinion from a perusal of the enormous literature on the subject, with its labyrinth of errors and exaggerations, out of which it is difficult to extricate one's self, seems to be that the drug is of inestimable value in the control of practically all the manifest lesions of the disease, but that it is not, at least in the present dosage and mode of application, a certain